Department of Environmental Conservation (DEC) Comment Response
Draft Proposed Site-Specific Criteria and Seasonal Use Revision for Chuit River and Three Tributaries
May 2015

Introduction

The U.S. Environmental Protection Agency (EPA) Region 10 provided informal comments on December 12, 2014, January 8, 2015, and March 25, 2015 regarding DEC's *Decision Document for Site-Specific Criteria (SSC) for Bass Creek, Middle Creek and Lone Creek, Tributaries of the Chuit River and Lower Chuit River to Tidewater Terminus* (draft SSC Decision Document), dated July 25, 2014 and *Decision Document for Reclassification of Designated Use (Agriculture) on Bass Creek, Middle Creek, and Lone Creek, Tributaries of the Chuit River* (draft Use Decision Document), dated July 25, 2014 for waters associated with the Chuitna Coal Project. EPA has raised concern with several aspects of the project proposal. The concerns specific to the site-specific criteria (SSC) process include several "fundamental" aspects of the project. These include use of a water effects ratio (WER) study/process for deriving SSC, site water characterization, and the role of groundwater interaction with surface waters. EPA also provided comments regarding the selected fish consumption rate (FCR) used to derive human health SSC for manganese and DEC's submission of a downstream protection analysis.

DEC and the applicant recognize that many of the issues raised in this document are similar to comments provided by EPA on August 9, 2009 following discussions on the proposed study plan, during the technical session teleconferences on August 8-9, 2009, and on numerous occasions since then by EPA staff. However, several significant new issues have been raised by EPA following review of the 2014 draft Decision Documents.

DEC is providing this Comment Response document to EPA in an effort to openly address concerns, reconcile differences, and demonstrate a collaborative approach to water quality management.

DEC is providing EPA's text in full for reference purposes. DEC's responses are in red font.

A. Aquatic Life Site-Specific Criteria

EPA Comment (12-12-2014): The following comments focus on two general areas: 1) the appropriateness and protectiveness of the proposed Water Effects Ratio (WER)-based SSC. For copper, this analysis includes a comparison to the Biotic Ligand Model (BLM)-derived copper Instantaneous Water Quality Criteria (IWQC) based on available water quality data, and, 2) an

assessment of potential water quality issues associated with groundwater resources on site that may be used to supplement surface waters during low flow. For the following reasons, DEC's draft SSC Decision Document does not reflect that DEC has developed a sound scientific rationale for the proposed site-specific criteria for aquatic life protection.

DEC Response: The biotic ligand model (BLM), another procedure for potentially developing site-specific criteria, requires the measurement of several water quality constituents over a long period of time in an attempt to determine the reduction of copper bioavailability in site water. Using these data, the BLM predicts the LC50 (lethal concentration, 50%) copper concentration for daphnids such as Daphnia magna. The BLM considers a number of important factors to estimate copper bioavailability, but it cannot include every factor that influences copper toxicity on Daphnia. For one, some of the constituents used in the BLM are not routinely measured by water quality agencies and utilities such as calcium, potassium, sodium, sulfide, dissolved inorganic carbon, carbonate, and bicarbonate. In cases where constituent data are not measured (such as several of these in the Chuitna WER testing) the BLM predicts their concentrations based on those constituents for which there are measurements. In the BLM, sulfate, chloride, and dissolved inorganic carbon are required measurements. The lack of actual required constituent data for the BLM presents several uncertainties in the predicted results. The WER, on the other hand, uses actual site water and incorporates all contributing factors to directly measures copper toxicity to the species. The WER test provides the actual measurement of toxicity to the organism and provides a definitive answer of toxicity rather than the BLM's projection. Some States and EPA Regions accept *either* the BLM or the WER approach for developing site-specific criteria for copper but not both. Which protocol to use is decided upon in the project proposal and quality assurance project plan (QAPP). To our knowledge, no State or EPA Region requires or preferentially accepts only one of these two procedures.

This is the first time use of the BLM for the purposes of developing criteria has been mentioned by EPA. According to EPA, either a WER or a BLM is an acceptable method for determining SSC. However, these methods are independent and <u>not interdependent</u>, and for this SSC, a WER was the applicant (and DEC approved) method of choice.

Since the 2009 inception of this effort to establish SSC, DEC has solicited EPA's input at every decision point. At no time did EPA infer that application of the WER rather than the BLM was problematic for establishing SSC. EPA had several occasions to interject their preferred method including in-person visits to Region 10 Headquarters. EPA was fully informed from the onset that a WER was being performed according to EPA's established procedures and protocols. Suggesting that use of a model against the direct measurement of toxicity undermines DEC's efforts to date and the creditability for the regulatory review process.

Comparisons between toxicity assessments done by WER method and assessments done by BLM are not valid because the two methods have difference assumptions and biases. The BLM results are biased to be more conservative because of uncertainties when modeling toxicity compared to actual toxicity measured for the WER testing. In addition, greater uncertainty was introduced into BLM results in this case since much of the required data was not available to fully implement the BLM, which biased the data even further in a conservative direction compared to WER data for which data was specifically collected in the studies supporting the proposed SSC. DEC requests that review of this project only consider application of the WER as that is the chosen method for this project and regulatory review.

I. Copper

1. Applicability of streamlined WER methodology for copper

EPA Comment (12-12-2014): The proposal states that both the *Interim Guidance on Determination and Use of Water-Effects Ratios for Metals* (EPA 1994) and the *Streamlined Water-Effects Ratio Procedures for Discharges of Copper* (EPA 2001) were used for this project. The use of the streamlined WER guidance appears inappropriate in this case because application is intended for copper point source discharges under well characterized stable flow conditions. This project does not have any of those elements. Further, the applicability of the various types of WERs (Type 1 and 2), given that there is currently no discharge-related variability and no effluent, is an important consideration regarding the appropriateness of the use of WER overall. EPA recognizes that it has commented that the denominator in the WER calculation should be the greater of the determined LC50 in laboratory water or the documented species mean acute value (Appendix A, section G.3.c of the Streamlined

Approach). That step is independent of the point source discharge and receiving stream design flow conditions necessary to satisfy the applicability of the Streamlined Approach.

DEC Response: EPA, States, and permittees have used WERs to develop site-specific criteria based on site water testing, similar to the Chuitna WER study. Since site-specific criteria are applied to the waterbody, not an effluent, it is appropriate to develop site-specific criteria using EPA's 1994 WER procedure. The procedures followed in the copper WER study were informed in part by EPA's Streamlined Copper WER guidance to add the conservatism of using EPA's species mean acute value (SMAV) for copper rather than the laboratory water toxicity value if the latter was lower. Using a higher lab water value increases the denominator of the WER calculation resulting in a lower WER. EPA's Interim WER Guidance does not include use of the SMAV in the WER calculation.

In regards to EPA's concerns about stable flows and relevance to the Streamlined Procedure, the introduction of EPA-822-R-01-005 (March 2001) states the following:

On page one of EPA-822-R-01-005, the document addresses stable flow as follows:

> The Streamlined Procedure involves the sampling of two events, spaced at least one month apart. Flow during each event should be stable, and water quality unaffected by recent rainfall runoff events.

On page three, EPA-822-R-01-005 references stable flow as follows:

> Stream conditions during sampling events should be as follows: stable flow condition, preferably during a drier weather season (wherever regulatory schedules allow).

On page 24, EPA-822-R-01-005 refers to characterizing a site as follows:

> The water-effect ratio (WER) reflects the effect that local site water constituents have on increasing or reducing the pollutant bioavailability and toxicity. The concentrations of the site water constituents that control the WER can be expected to vary over time, as do all water quality parameters. A site's WER would thus also vary over time. Consequently, the number of samples in any reasonably feasible sampling scheme cannot fully characterize the site.

Finally on page 34, EPA-822-R-01-005 mentions stable flow for the last time as follows.

> For a single sample obtained during stable flow events …

The procedures concern themselves with stable flow throughout a single sampling event, and that is the only context where stable flow arises. Regarding the aspect of the comment about "well characterized stable flow" the only place where EPA-822-R-01-005 addresses characterization in a manner close to the context of concern is when it concedes that no sampling scheme can fully characterize the dynamics of an aquatic ecosystem.

DEC believes that the sampling approach and methodology used for the WER was conducted according to 1994 protocols. Three rounds of WER testing were performed in the WER study rather than two rounds as recommended in EPA's streamlined WER guidance. The use of site water representing the typical range of recorded flows, including low flow conditions as recommended in the Interim Guidance, provides important information regarding the final WER for this site. This testing of different flow conditions is not addressed in EPA's streamlined WER guidance but is important for identifying a final WER.

2. Representativeness of sampling for the calculation of the proposed WER-based SSC for metals in the Chuit Basin

EPA Comment (12-12-2014): The WER proposal selected one sampling location (Station 141 located on Middle/2003 Creek) for WER testing as a surrogate to represent conditions across the entire site. Also, sampling was conducted just 3 times over a period of only 2 months. Such limited sampling gives EPA reasonable cause to be concerned about whether Station 141 is a representative surrogate for the water chemistry in the watershed where mining activities will occur. Specifically, DEC has not supplied adequate evidence that Station 141 reflects the full temporal and spatial variability of the water chemistry in the watershed.

Copper bioavailability, and thus copper toxicity, is mainly influenced by 3 parameters – Dissolved Organic Carbon (DOC), pH, and hardness. To further expand the limited set of conditions under which the proposed WER was conducted, EPA used the available Riverside Technologies Inc. 2009 water chemistry report (Appendix B16: Historical Surface Water Quality) and analyzed a subset of data from the most recent collection period, 2006-2008, to better characterize the site spatially and temporally. The report shows a number of Total Organic Carbon (TOC) samples that were lower (<4-6 mg/L) than those at Station 141 (TOC = 4.5 - 7.7 mg/L) (either due to spatial or temporal

variation) across the potentially impacted site in a number of tributaries (Chuit River, Lone Creek, Middle Creek). This indicates that low TOC may be spatially and temporally prevalent.
Since DOC concentrations influence copper toxicity and are needed to complete BLM calculations for comparison with the WER-based results, EPA conducted a series of analyses using available DOC and TOC data from the 3 Station 141 WER runs (Table A2 of the draft SSC Decision Document) to estimate the DOC levels in any given TOC sample. This analysis was used to further consider how DOC may vary spatiotemporally across the site, and thus impact BLM estimates for copper across the site area. The ratio of DOC to TOC was 3:4, based on the data accompanying the Station 141 WERs. That is, it appeared that approximately 75% of the TOC was present as DOC. EPA used the estimated 75% DOC to TOC ratio from Station 141 and estimated the DOC at each location that had more than three sampling dates between 2006 and 2008. The analysis shows that estimated DOC would be less than or equal to 3 mg/L (but greater than 2 mg/L) for 28/130 sites (22%) and DOC would be ≤ 2 mg/L for 31/130 sites (24%). Based on this analysis, DOC would be at or below the lowest DOC tested in the WER analysis 46% of the time. Because DOC is a driver in reducing toxicity of copper in site waters, the relatively high DOC from the WER tests would be expected to result in overestimates of the WER and, after application to the base criteria, would result in site-specific criteria that are not protective of aquatic life.

Additional EPA Comment (03-25-2015): EPA provided comments on 12-12-2014 regarding the representativeness of the sampling location used for the toxicity tests that underlie the water effects ratios (WERs) used to develop the aquatic life SSC for aluminum, copper, and zinc. The toxicity of all three of these metals is affected by pH, dissolved organic carbon (DOC), and various ions present in the waters. With respect to copper, EPA stated that "...DEC has not supplied adequate evidence that Station 141 reflects the full temporal and spatial variability of the water chemistry in the watershed." Relative to aluminum, EPA stated: "Given the large variability in results observed within samples from one location, it is likely that additional tests across additional locations would reveal larger spatial and temporal variability." Although not explicitly stated in the 12-12-2014 comments, chemistry variability within the site is also relevant to zinc because the toxicity of zinc is similarly affected by pH, DOC, and the ion content of the water.

DEC Response: DEC has determined that the evidence supports using Station 141 for site water that is representative for all parameters of concern. This information is documented in Appendix A and in the various memos cited in the reference section of the draft SSC Decision Document that was provided to EPA in July 2014.

According to *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances,* as amended through December 12, 2008 and approved by EPA, copper and zinc toxicity are dependent on hardness, and are not directly dependent on pH and DOC. Due to the choice of method (WER) that was agreed upon during the development of this project, DOC was not considered to be a factor in the SSC decision-making process. Summary statistical information on the general chemistry of the different waterbodies in the basis, including Total Organic Carbon values, are located in *Comparison of Water Quality for Site Drainages with Water Effects Ratio Samples* (Tt. April 11, 2013) and referenced in Appendix A of the 2014 draft SSC Decision Document.

Site 141 is representative of the site under consideration. Numerous analyses of different sites in the Chuit River basin have demonstrated that water quality characteristics at site 141, the site used for WER sampling, are very representative of the water characteristics observed throughout the watershed area being proposed for site-specific criteria. This finding is consistent with the underlying geology and soil chemistry of this region. As discussed in the July 22, 2009 meeting with EPA, DEC, ADNR, OSM, USCOE and USFWS at Seattle EPA offices, this site was selected for the following reasons:

- It is the existing sample site that is located close to the mine site.
- It is an active water quality and flow station and it has more historic water quality data, collected over all types of flow conditions than other sites sampled in the Chuit River basin.
- Monitor data indicate that the water quality conditions at this site are similar to those observed at other locations in the basin (see supplemental submittals re-affirming this).
- Sampling was proposed at a range of flows, including a high and low flow condition, between August and October, with several weeks between sample events.

Following this meeting, both DEC (on August 6) and EPA (on August 12) submitted comments on the draft study plan. Both agencies requested, among other things, that additional field parameters from past sampling events be compared (i.e. pH, DOC) as further justification for selecting C141 as representative. In EPA's comment letter, they state "*Further definition of the site and support for the proposed site water is necessary. The Alaska Department of Environmental Conservation (DEC) should play a key role in site definition.*"

Following submittal of comments, EPA and DEC had several internal discussions on the issue, with Jim Powell leading the State's efforts and Bill Beckwith leading EPA's technical review. Other parties from both agencies were also involved. PacRim began internal work on adding an Appendix A in the revised study plan to address that specific concern.

On September 10, 2009, the agencies and PacRim held a meeting to go through several of the agency comments/issues/concerns, item II on the agenda was review of the WER procedure. Key questions and some of the data presented included (related to C141):

- Piper diagrams were presented to show the uniform nature of the water in the basin from the various monitor stations (DEC expressed an understanding of the uniformity when these were presented)
- Discussion on seasonality and flow conditions – DEC wanted to see a deeper review of field parameters between sites (i.e. box/whisker plots) for items such as pH and DOC. Requested flow and pH be added to table on Page 45 of draft study plan
- Discussion of proposed sampling in all flow conditions (DEC) – low, high, average. EPA demonstrated more interest in low and average flows but less so under high flow conditions. In fact, EPA suggested that there be no testing at high flow and it focus more on the low flows[1].
- DEC requested a QA/QC plan be prepared for sample collection. PacRim agreed to supply one.

[1] Note that the WER demonstrated an Al value of 22 at low flow and 7.68 under high flow conditions

On August 20th, 2009, PacRim submitted a revised study plan that included Appendix A, which focused on the representativeness of C141 for waters in the Chuit basin.

A follow up call with DEC, EPA and PacRim was held on September 14th. DEC and EPA are working on another set of final comments. On September 15, 2009, EPA submitted comments via e-mail to DEC. While it touches on statistical questions of a final WER calculation for Al and some concern over a high flow event, it does not provide any further comment or question about sample location.

On September 18, 2009, another meeting was held with EPA, DEC and PacRim regarding WER testing. The specifics discussed were (1) clarifications on piper plots, (2) discussion on flow, flow regimes, variability, (3) another request from DEC for a QAPP, (4) the introduction/request for a mixed metal confirmation test at some point following EPA guidance, and (5) a repeat request for tables and graphs showing variability of certain water quality parameters with flow (box and whisker plots). PacRim followed up the discussion with a letter to Allan Nakanishi dated September 23, 2009 in response to information requests from the September 18th meeting regarding flow and water quality. A QAPP was submitted on September 24th.

On September 24th, EPA and PacRim had a telecom to discuss some ongoing items related to WER testing and aluminum, specifically pH. PacRim's contractor, Tetra Tech, responded with a memo to Bill Beckwith at EPA on September 29, 2009 discussing site pH data and the WER testing. EPA noted that the testing pH was low enough to properly represent the site water. In the memo, Tetra Tech shows that 97% of the samples collected to date had pH's of >6.8, and less than 2% (3 samples) showed a pH of less than 6.5. This memo also included graphs that show flow vs conductivity, TOC, alkalinity, TSS, pH and TDS.

At this point, DEC and PacRim were under the impression that comments on the WER portion of the study plan had been addressed sufficiently. With no comments remaining, PacRim instructed crews to monitor the weather and initiate site water collection and testing as per the agreed upon study plan.

EPA Comment (3-25-15)

Because of the variability in factors that affect metals bioavailability and to ensure that the SSC are protective of the entire site to which they apply, all types of surface waters should be considered during selection of sample locations. Waters of the streams to which the SSC will be applied pass through wetlands, and they also appear to pass through lakes in several locations, according to available maps. The chemical characteristics of wetland and lake waters may be different from stream water, and the bioavailability of metals in wetlands and lakes may therefore also be different from streams. In this case, the SSC and underlying WERs may not be representative of those lakes and wetlands.

Based on information provided in *Chuitna Coal Project Mine Sites Lakes Preliminary Water Quality Assessment Summary Report* (PacRim Coal, 2010), the four lakes tested in 2009 had "lower ion concentrations than typically found in the surface waters and groundwater in the area" and correspondingly lower hardness values. This implies that any added metals could be more bioavailable in these lakes than in the streams or in groundwater used to supplement stream flows as part of the mine dewatering process. If any lakes in the mine project area receive water from streams to which the SSC would apply, the lake water chemistry would need to be considered to evaluate the representativeness of the sampling locations used for SSC development.

Water quality data for wetlands were not available for EPA review and parameters that affect metals toxicity relative to stream water could not be evaluated. Wetland waters may exhibit lower pH than stream waters, which could result in greater bioavailability of metals. Waters in wetlands should be evaluated to ensure that the WER would apply and the SSC would be protective.

DEC Response: DEC notes that this is a new issue**.** DEC is only considering application of SSC for Bass, Middle, and Lone Creeks and not to those areas outside of the immediate stream channel(s). Based on EPA's definition of Site found in the 2014 Edition of the U.S. EPA Water Quality Standards Handbook: 3.7.3 Definition of a Site*:*

> "In the general context of site-specific criteria, a 'site' may be a state, region, watershed, water-body, or segment of a waterbody. The site-specific criterion is to be derived to provide adequate protection for the entire site, however the site is defined."

DEC asserts that the 'site' of the proposed SSC only applies to waters within the designated stream channel(s). DEC considers the degree of variability between the different stream-water sampling stations associated with the "site" to be minimal and representative of the surface waters associated with the proposed SSC. A comparison of results from the *Chuitna Coal Project Mine Sites Lakes Preliminary Water Quality Assessment Summary Report* (PacRim Coal, 2010) and Riverside 2009 and 2010 reports indicate that the major anions, cations, and ion concentrations of lake and stream surface waters are chemically similar to one another and typical of surface and groundwater in the area. The WER results are sufficiently similar to demonstrate protection regardless of season or flow conditions, and applicable to the "site" in whole, which in this case is Bass, Middle, and Lone Creeks and not adjacent lakes and wetlands.

Review of flow information associated with the site suggests that the lakes and wetlands where EPA may have concern (with the exception of two waters on Lone Creek) are hydrologically "upstream" of the proposed SSC site(s). DEC reminds EPA that this area is considered to be subject to a very high groundwater table with stream slopes ranging from 1.04% to 1.25%. The area is well vegetated; and muskegs, beaver dams, and rich organic detritus are common across all three drainage basins. What drainage does occur is simply a reflection of water moving in the direction of least resistance (i.e., gradient). For illustrative purposes, a general flow map is included in Figure A-1 in the Appendix of this document.

DEC requests additional clarification from EPA regarding whether the request to review lakes and wetlands upstream or adjacent to the proposed waterbodies is consistent with previous SSC review practices. This issue has not been raised in the 6 years the process has been underway, nor has application of the SSC to the aforementioned waterbodies been nor is being proposed at this time. The lakes and wetlands in the region feed into the streams, not the inverse as assumed in the comment. An assessment of downstream protection and loading has been provided previously to demonstrate that the proposed SSC are protective of downstream designated and existing uses. However, upstream protection and analysis is not required in the Clean Water Act, state water quality standards, or by DEC policy.

3. 3. Comparison with Copper BLM indicates WER is not protective, particularly for Round 3 (the low flow scenario)

EPA Comment (12-12-2014): A comparison of the BLM and the WER using the same run-specific water quality (with low ions for BLM being most conservative) shows a 5-fold difference in the acute value and ~6.5-fold difference in the chronic value between the BLM-based estimates and the WER-adjusted SSC (where the WER from that scenario is applied to DEC's existing criteria at a hardness of 25). One reason for this difference is DEC's proposed use of 25mg/L hardness, rather than site water hardness (see subsequent comment). Another source of difference between the two approaches can be explained by the comparison of pH utilized. For the BLM, the actual site pH (6.7) is used whereas the pH during the site water toxicity test for the WER for *Daphnia magna* in Round 3 ranged from 7.2-8.0 in test containers (comparing the site water pH from Table A2 of DEC's draft SSC Decision Document with the pH during the actual toxicity test in Table 3.8b of Tetra Tech's March 12, 2010 WER report). This is a minimum difference of ½ pH unit between the analyses, which is a substantial difference since pH is a logarithmic function. Because lower pH increases ionization of metals, a toxicity test run at a pH of 6.7 would likely result in a lower LC50, and this in turn would reduce the WER-based criteria, although the magnitude of the change is uncertain.

Comparison of BLM and WER-based Criteria for WER Round 3	Criteria Calculated Using BLM at Low Flow Site Conditions*	**Calculated** Criteria Using Low Flow WER of 5.11** and Hardness of 25 mg/L
CMC	3.51 ug/L	18.06 ug/L
CCC	2.18 ug/L	14.00 ug/L

* Low Flow Site Conditions: DOC = 3.1, pH = 6.7, Hardness = 18

** The calculated values for the individual WER rounds for copper in DEC's draft SSC Decision Document are consistent with those in Tables 3.10, 3.11, and 3.12 and section 4.2 of the WER determination report (Tetra Tech, March 12, 2010, pages 22, 23, and 30). However, division of the site water LC50's by the site hardness normalized lab water LC50s (or SMAV as applicable) in the last column of those tables yields 8.8, 5.2857, and 4.875, for Rounds 1 thru 3, respectively (before rounding). This discrepancy should be addressed.

DEC Response: Analysis for the SSC was performed using a WER and the BLM was neither used nor considered in this effort. DEC requests that EPA refrain from making any decisions by directly comparing the two approaches. See DEC's response to sections A. I. Copper, and IV. Hardness for additional detail on DEC concerns with this comparison.

II. Aluminum

1. Establishment of the proposed WER-based SSC for aluminum for the entire site based on one location.

EPA Comment (12-12-2014): The trend observed with the WER based on the flow is highly variable and inadequately explained and characterized.

	Flow	WER
Round 1	"High" (13.1 cfs)	7.11
Round 2	"Medium" (6.4 cfs)	2.68
Round 3	"Low" (1.7 cfs)	22.0

The three WERs have a wide range (2.68-22.0) and are highly variable. There is inadequate explanation or hypothesis provided why this trend is observed in the toxicity tests. Additional testing for a larger number of sample locations would help clarify and is suggested. The entire site is being characterized by three samples collected from one sample location. This is not adequate in light of the large variability in toxicity observed across the different flow rates. Given the large variability in results observed within samples from one location, it is likely that additional tests across additional locations would reveal larger spatial and temporal variability.

Additional EPA Comment (03-25-2015): In its December, 2014 comments, EPA expressed a concern that there was a high degree of uncertainty regarding what would be an appropriately protective WER for aluminum for the site, and recommended that either additional testing be performed or that the WER of 2.68 be used (i.e., the lowest of the three aluminum WERs that have been determined to date). However, given the high degree of uncertainty as to whether the site has been adequately characterized by the three site water samples used in the WER determinations, EPA is clarifying now that the use of a WER of 2.68 would require further justification to demonstrate that it is protective of the site.

DEC Response: The proposal to use C141 as a representative sample site, along with supporting documentation reasoning, was part of the Study Plan review process that took place between July and late September, 2009. The Study plan was revised extensively to address just this issue, among other items. EPA made no further comment on site representativeness following the September meetings, discussions and submittals prior to testing nor during initial review of test results. As for the calculation of the WER, procedures provided in EPA -823-B-94-001 (Interim Guidance, 1994) and EPA-822-R-01-005 (Streamlined Guidance, 2001) were followed during the development and interpretation of the aluminum WER results of 7.48. Additional comments regarding flow are addressed in the following section. After additional review, DEC still maintains that the WER study was conducted appropriately and that the resulting values are acceptable as noted in PacRim (2010) *Determination of an Aluminum, Copper, Lead, and Zinc Water Effect Ration for the Chuit River Basin, Alaska* and Solfield (2014) *A Review of the Methodology Used to Derive Site Specific Water Quality Criteria for Al, Cu, and Zn in the Chuit River, Alaska.* Additional details regarding the WER process, use of Site 141 as representative site water, and resulting WER values are addressed in detail in previous DEC responses in Section I.

The peer-reviewed literature is replete with studies reporting the low bioavailability (low toxicity) of aluminum at circum-neutral pH, which is the pH regime observed in the Chuit Basin. Aluminum toxicity is not expected under these conditions as was demonstrated in the WER tests, even using a lower pH (near 6.5) and a low hardness similar to that observed in site water in the Basin. The fact that there was variability in site and lab water aluminum toxicity values among the three WER tests (and therefore variability in the WERs) is expected given the nature of toxicity tests and the difficulties in predicting solubility and bioavailability of aluminum under slightly acidic conditions. Even under identical test conditions, LC50 values, and therefore WERs can vary due solely to differences in the test organisms used. EPA typically considers a factor of 2 for LC50 values as essentially similar in terms of aquatic life criteria derivation because this is within normal precision of the test. In fact, LC50 values for a given species and life stage can vary across tests by a factor of 10 for a given chemical even when critical water quality conditions are similar. For example, EPA reported in their 1988 criteria document LC50 data for *Daphnia magna* of 3,900 and >25,300 mg/L for tests using similar hardness and pH regime. Other metal criteria documents reported such

ranges for the same life stage and similar water quality conditions. For example LC50 values for fathead minnow fry (< 24 h old) ranged between 17 and 123 ug/L (a factor of nearly 8) at the same hardness and within the same EPA lab.

The WERs observed for the three testing rounds represented different flows and therefore different water quality conditions. All of the tests were conducted using EPA – approved test methods and all tests were valid based on EPA's test acceptability criteria. Furthermore, EPA WER guidance recommends using the geometric mean as the Final WER. There is no scientific reason to use any other value as the Final WER nor is there a need for additional data collection because the confirmation test indicated no issue when aluminum was added at the proposed criteria concentration. Given the wealth of information indicating no acute or chronic toxicity at aluminum concentrations greater than approximately 1000 mg/L at circum-neutral pH, it would be indefensible to apply anything less than the geometric mean WER.

2. Inadequacy of the use of the geometric mean

EPA Comment (12-12-2014): Given the variability of the WERs determined for station 141 and the concerns with the round 3 WER (discussed below), EPA does not believe that the *Interim Guidance on the Use of Water Effect Ratios for Metals,* (USEPA, 1994) should be used as a basis to conclude that a geometric mean of the three WERs is appropriate as a final WER. Furthermore, the options in the 1994 Interim Guidance for calculating final WERs are dependent upon the stream flow conditions when individual WERs were determined relative to design flow conditions. Design flow conditions for the application of aquatic life criteria have not been established for the site. Use of the *Streamlined Water-Effect Ratio Procedure for Copper* (USEPA, 2001) to support a geometric mean is not appropriate here. The 2001 method is intended to apply to situations where most of the metal is from continuous point source effluents, the metal is expected to attain its highest concentration under low flow conditions, and the site water quality used in testing is unaffected by recent rainfall events. In contrast, Appendix A of the draft SSC Decision Document speaks to elevated metals concentrations during high stream flow events (p. 34), as does Appendix D specifically for aluminum (p. 60).

The wide variability of the WERs from the three rounds of testing raises concerns that use of a geometric WER may result in a criterion that is not protective. In particular, EPA notes that the

measured pH (6.7) and DOC (3.1 mg/l) for the round 3 WER site water sample suggest that aluminum should have been more bioavailable and would have been expected to result in a lower site water LC50 with an associated smaller WER than calculated. Therefore, incorporation of the Round 3 WER in the geometric mean is questionable.

Due to the high degree of uncertainty regarding what would be an appropriately protective WER to cover the site as a whole, the use of a more protective final WER of 2.68 is recommended, or additional testing should be performed. Additional WER tests could provide useful information regarding a protective and appropriate site-specific criterion for this site.

DEC Response: DEC believes that EPA's position regarding varied flow conditions is an inaccurate interpretation of the guidance and that application of the geometric mean follows EPA-approved protocols.

Because different flow conditions were examined in the WER study, it is understood that there will be somewhat differing water quality characteristics of the site water used in each of the three rounds of WER testing. This variability was accounted for by differences in alkalinity, hardness, and DOC among multiple site water samples used in the toxicity testing, as well as other unmeasured factors that could affect metal bioavailability in site water. These differences in site water characteristics are important for determining an appropriate final WER for the study because the range in characteristics reflects what organisms are exposed to in the Chuit River. Consistent with EPA's guidance on final WER determinations, a geometric mean was used to derive a final WER for each metal. There is no information to suggest doing otherwise because all of the flow conditions tested occur frequently in this system and are therefore equally important to aquatic life. Use of the geometric mean for WER purposes has previously been approved of by EPA Region 3 (documentation available upon request) and considered to be standard practice. In summary, EPA procedures recommend using a geometric mean under these circumstances, and DEC lacks the authority to arbitrarily reject the prescribed rules because that would undermine EPA's published methods.

In this case, the different WERs observed may be related to differences in site and lab water pH and hardness. Site water pH was generally within 0.3 pH units of the lab water pH in the first two rounds and generally within 0.5 pH units in the third round (lab water pH was slightly lower in the

third round). While many precautions were used to achieve a consistent lab water pH, some decrease in the lab water pH during the WER tests was inevitable due to the high aluminum chloride concentrations (a weak acid) needed to elicit an organism response. The lab water by its very nature is not well buffered having none of the natural ligands that would help maintain a stable pH with such high aluminum concentrations. Somewhat lower lab water pH compared to site water in the third round may have contributed to a higher WER in the third round. In addition, site water hardness was slightly higher in the third round compared to previous rounds, which may also have contributed to a higher site water LC50 and therefore a higher WER. Given the low flow conditions for the site water in the third round, it is quite likely that this site water contained a higher concentration of ligands that could complex aluminum yielding a higher WER. Therefore, it is appropriate to consider all of the WER data in the final WER calculation using a geometric mean.

Even under ideal circumstances, site water flow is never truly stable, nor is it feasible to conduct WER testing only when site water flow is at some "stable" condition. The Interim Guidance is intended to guard against using water collected during high flows, which may contain elevated suspended solids, thereby potentially increasing the WER via absorption of metal to solids. Testing was conducted under naturally varying base-flow conditions, which is appropriate for WER testing.

3. **Concerns over sensitive species.**

EPA Comment (12-12-2014): In the current aluminum database, the four most sensitive species for chronic toxicity are listed:

Rank	Genus Mean Chronic Value (µg/L) (6.5≤ pH <9.0)	Species
4	2,577	Fathead minnow, *Pimephales promelas*
3	2,168	Midge, *Chironomus riparius*
2	1,636	Brook trout, *Salvelinus fontinalis*
1	1,479	Cladoceran, *Ceriodaphnia dubia*

In the 1988 criteria document: *Ambient Water Quality Criteria for Aluminum - 1988* (EPA 1988), the chronic aluminum criteria of 87 μ g/L is based upon two no observed effect concentrations (NOECs) from studies with brook trout (*Salvelinus fontinalis*) and striped bass (*Morone saxatilis*). EPA has concerns about the sensitivity of salmonids to aluminum, potentially both at the site and downstream of the site. The Alaska Department of Fish and Game website notes that "The Chuit River is on the west side of Cook Inlet 40 miles west of Anchorage. It is a popular public sport fishing location for king salmon, silver salmon, and rainbow trout" and "All five species of Pacific salmon, Pacific herring, and smelt are commercially harvested in the Cook Inlet Area". Thus, potential downstream impacts from the site due to aluminum, and other metals, on salmonids and other taxa should be considered.

DEC Response: DEC and EPA raised similar issues associated with test species when commenting on the study plan (08-12-2009). PacRim responded to DEC on August 18, 2009 and EPA on August 19, 2009.[2] DEC believes the decision to use standard test species rather than resident species was correct and consistent with EPA protocols. DEC has reviewed the guidance found in the *Technical Support Document for Water Quality-based Toxics Control, (*EPA, 1991), as presented below:

> "Sometimes, regulatory agencies require testing on representative resident species under the assumption that such tests are needed to assess impact to local biota. EPA considers it unnecessary to test resident species since standard test species have been shown to represent the sensitive range of all ecosystems analyzed. Resident species toxicity testing is strongly discouraged unless it is required by State statute or some other legally binding factor, or it has been determined that a unique resident species would be far more protective of the receiving water than the EPA surrogate species."

WER guidance does not explicitly call for the use of specific species when conducting toxicity tests but rather should apply indicator species from a recommended list. DEC believes the applicant followed accepted WER protocols and practices as stated in the WER proposal:

> "Acute testing will be conducted using *Daphnia* sp. or *Ceriodaphnia dubia* neonates (<24 h old) as the primary test species and larval *Pimephalespromelas* (fathead minnow) (1-14 d old) as the secondary test species. Due to the low hardness of site water, *Daphnia* sp. may be used because they are more tolerant of low hardness waters. The first test round of testing will be conducted

[2] Tetra Tech Inc. *Memorandum.* August 19, 2009 *Response to USEPA Comments (8/12/09) on Study Plan*. To Dan Graham, PacRim Coal LLC

> with both species and subsequent testing events will use the more sensitive only (Tt 2009, WER Study Plan p.19)."

EPA WER guidance (EPA, 1994b) specifically recommends use of these species in calculating WERs for these metals. EPA, (1994b) does not recommend against the use of salmonids in developing WERs for these metals, however the use of salmonids is not specifically recommended. Further, EPA WER guidance (EPA, 1994b) indicates that there is no difference in WERs produced using cold water versus warm water species. Specifically, page 23 of the guidance states,

> "Because there is no rationale that suggest that it makes any difference whether the test is conducted with a species that is warm water or cold water, a fish or an invertebrate, or resident or nonresident at the sites, other than the fact that less sensitive tests are likely to give smaller WERs, such considerations as the availability of test organisms might be important in the selection of the test."

Thus, there is no reason to believe that cold water species (e.g., trout) will yield a different WER than the species preferred by EPA (Daphnids or fathead minnow).

EPA (2001) *Streamlined Guidance* is consistent with that of the 1994 in which:

> *"Ceriodaphnia dubia* or *Daphnia magna* are listed as appropriate species. Only with appropriate modification of protocol should other test species be substituted (pg. 9)."

> "Other test species, either fresh or saltwater, could be substituted, provided that ample data were available to determine the appropriate SMAV (pg. 5)."

Daphnia sp., *C. dubia* and *P. promelas* are currently used in Alaska for the demonstration of acute and chronic toxicity under the National Pollutant Discharge Elimination System (NPDES) program. These species are used because the methods are well developed; they tend to be sensitive to pollutants (specifically metals); and they are easily handled in a laboratory setting.

Finally, the aluminum criterion was not developed using methods that would be considered appropriate under their current guidance or by contemporary toxicological methodology. Since these guidelines were issued in 1988, members of both the scientific and regulatory communities have identified several issues of concern with the derivation and current application of the criterion. As a result, EPA has since acknowledged that "many high quality waters in the U.S. contain more than 87 g [*sic*] aluminum/L". Acknowledging the lack of adequate data to support the chronic criterion,

EPA's own Recommended Water Quality Criteria (EPA, 2014[3]) and the Alaska Water Quality Standards (18 AAC 70, 2012) both state that site specific Water Effect Ratio studies should be used to develop chronic criterion for aluminum. Because of the poor nature of the science regarding aluminum chronic toxicity, thirty one states including Washington, Oregon and Idaho in EPA Region 10, have chosen not to establish a chronic criterion for aluminum and many of these states have not adopted an acute criterion. These states' standards have all been approved by EPA.

III. Zinc

EPA Comment (12-12-2014): Given that two of the three WERs determined for zinc were reported as 0.94 and 1.00 (the third being 1.72) and considering EPA's comments concerning the use of just three samples from one location to characterize the entire site, EPA is concerned that the data may not support an increase in the zinc aquatic life criteria.

DEC Response: DEC believes that it has addressed concerns with use of Site 141 in Section I and II.

IV. Hardness at which criteria are calculated for copper and zinc

EPA Comment (12-12-2014): Throughout DEC's draft SSC Decision Document, both the current criteria and the proposed site-specific criteria for copper and zinc are calculated with a hardness of 25 mg/l (e.g., Tables 1, 3, 5, and the discussion on page 16). However, the hardness values for the three site water samples used in the WER testing were reported as 12, 16, and 18 mg/l; and additional hardness data for tributaries at the site show average values of 20 mg/l or lower, with minimum hardness values of 5 mg/l (Tables A2 and A4, and Figure A7 of DEC's draft SSC Decision Document). There are a number of reasons why using a "capped" hardness of 25 mg/l to calculate criteria for this site, including the proposed site-specific criteria for copper and zinc, is not appropriate.

The memorandum *Modifications to Guidance Site-Specific Criteria* (EPA, December 3, 1997, Special Uses of the WER Procedure, pg. 4) indicates that if a hardness of 25 mg/l is used in a hardness equation when the actual hardness of the site water is less than 25 mg/l, the resulting level of protection will

[3] U.S. Environmental Protection Agency. 2014. National Recommended Water Quality Criteria. Office of Water, Washington, D.C.

probably be below that intended by EPA's 1985 guidelines for criteria development (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (EPA 822/R-85-100), states

> The WER Procedure can be used to provide the intended level of protection when hardness is below 25 mg/L if the WERs…are determined as described [in the guidance] and if the FWER is multiplied times the national criterion concentration that corresponds to the average hardness of the downstream site water at design flow. The FWER must not be multiplied times the national criterion concentration for 25 mg/L.

EPA's National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047, November 2002) recommends that hardness not be capped at 25 mg/l, or any other lower hardness, to ensure that protection is not less than intended by EPA's 1985 Guidelines for criteria development.

Alaska's water quality standards specify that that the actual hardness of the surface water should be used when the hardness is less than 25 mg/l as CaCO3 (Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, as amended through December 12, 2008, endnote 25).

DEC Response: EPA's comment appears to be based on position that the *Streamlined* Guidance is not appropriate or applicable to developing SSC for copper. It is not the intent of DEC to use the Streamlined Guidance to develop the WER in this case nor to suggest that a fixed hardness (i.e., 25) exists for SSC but rather the use of 25 is simply illustrative of the applicable criteria is the product of the relationship between the WER and hardness.

From TetraTech WER Study Plan. 2010. Section 2.10 p. 15

> "LC50 values for each test, based on measured metal values for each concentration, were computed using the software CETIS (Tidepool Scientific Software). The linear interpolation method was used to calculate the LC50 values."
>
> "Because the laboratory dilution water was not the same hardness as the site water, all laboratory water LC50s were adjusted using the EPA hardness equation in order compare the laboratory and site water LC50s (Equation 2.1)."
>
> **Equation 2.1.** EPA Hardness Equation:
>
> $$\text{Lab } LC_{50 \text{ at site hardness}} = e^{\ln(\text{lab LC50}) - (\text{slope} \times (\ln(\text{lab hardness}) - \ln(\text{site hardness})))}$$

slope = 0.9422 for copper; 1.274 for lead; and 0.8473 for zinc.

> "After adjusting for any hardness differences, the WER for the sample was the site-water LC50 divided by the greater of the LC50 calculated using synthetic laboratory water or the species mean acute value (SMAV) for the test species (EPA 2001). The geometric mean of the three sampling event WERs became the final WER."

DEC is proposing that SSC for use on Lone (2002), Middle (2003) and Bass (2004) Creeks, and main stem of the Chuit will be accomplished by using the DEC-adopted hardness based equations multiplied by the WER as shown in the following example for the chronic criteria for copper:

$$\text{Chronic (dissolved)} = \exp^{\{0.8545 * [\ln(\text{hardness})] - 1.702\}} * \text{CF} * \text{WER}$$

Where: CF = the conversion factor for copper = 0.960
WER for copper = 6.17

Table 5.1 of the WER report is not intended to set SSC for the tested metals on a universal basis, but to demonstrate what the criteria would be using a hardness of 25 mg/L. As discussed in the comment response for IV, the exact hardness used in the tests to perform the WER calculation is irrelevant. The WER method is not dependent on having the hardness in the reconstituted laboratory water match the measured hardness of the sampled effluent or that the hardness reflects a range of hardness in the effluent. Rather, the measured LC50 is adjusted using the same hardness based equation for copper that is used to calculate the dissolved criteria to determine the final WER. After this adjustment, the final WER is a ratio that has no unit and can now be used for any site hardness. Once the WER is calculated it is applied to DEC's hardness-based criteria equation for the appropriate metal using whatever hardness value DEC determines is appropriate for APDES permitting purposes or for 305(b) water quality assessments.

Moreover, a site hardness of 25 would not be appropriate where hardness from Station 141 ranges between 10 mg/L and 40 mg/L with a mean of 20.7 mg/L. Water quality data demonstrate that similar hardness values occur at other stations across the basin. The hardness used in both the draft SSC Decision Document and Downstream Assessment[4] appropriately applied the ambient measured hardness for the WER and the evaluated flow events to assess potential exceedances above water

[4] Tetra Tech Inc. *Memorandum.* December 17, 2013 *Loading Analysis*. To Dan Graham, PacRim Coal LLC

quality criteria. This is similar to the type of analysis that would be applied in performing water quality assessments under 305(b) and for conducting modeling to calculate TMDLs for an impaired waterbody.

V. Metals Mixture Test

EPA Comment (12-12-2014): EPA agrees that the metals mixture test in the 1994 WER guidance is not intended to itself be a method for deriving site-specific criteria. Rather, the metals mixture test is intended as a follow-up to individual WER analysis and associated site-specific criteria calculations for multiple metals to determine if the individual "proposed" site-specific criteria in combination will be protective. "Proposed" in this context refers to the phase in the site-specific criteria evaluation where the state has completed WER analysis for multiple metals and would move forward to proposal and adoption of site-specific criteria if not for confounding data, such as a toxicity test that shows the mix of the individual "proposed" criteria concentrations to be toxic. While EPA recognizes that some might find the description of the metals mixture test in the 1994 WER guidance in need of clarification, the interpretation presented by Sofield and reiterated by DEC on page 57 of its draft SSC Decision Document suggests that EPA presented the metals mixture test with no intended purpose.

With this clarification, EPA remains concerned that the metals mixture test is not adequate to conclude that the proposed site-specific criteria in DEC's draft SSC Decision Document would be protective. Reasons for this concern include:

Table 4 of the July 23, 2014 Sofield review presents a summary of water quality data for the "Chuitna site water used in confirmatory testing" (page 35) that calls into question the representativeness of that sample for use in the metal mixture test. Notably, hardness is reported at 38 mg/l, DOC at 4.3 mg/l, and total suspended solids (TSS) at 46 mg/l. Hardness data presented in DEC's draft SSC Decision Document indicates that 38 mg/l is at the high end of observations for the basin and well above the typical hardness for waters in the basin of 20 mg/l or less. As discussed elsewhere in these comments, estimated DOC concentrations for waters in the basin are often lower than 4.3 mg/l. The TSS value of 46 mg/l is also on the high end of TSS data presented in DEC's draft SSC Decision Document. For example, only one of the six sampling stations in Table A4 has a

reported maximum TSS value greater than 46 mg/l (i.e., 58 mg/l), the average TSS for all six stations is less than 6 mg/l, and the minimum TSS values are all approximately 1 mg/l or less. There is a concern that the water quality parameters in the metal mixture test might have reduced the toxicity of the spiked metals to a degree that would not typically occur in water at the site.

The July 23, 2014 Sofield review (pages 11-12) seems to call into question the statistical analysis that was used to evaluate the results of the metals mixture toxicity test, suggests that consultation with a statistician may be useful, but then continues to draw conclusions based on the assumption that the spiked site water sample did not produce statistically significant toxicity when compare to the site water control. Likewise, there is no indication in DEC's draft SSC Decision Document that there was any follow-up on Sofield's suggestion.

To further evaluate whether 85% survival of D. magna in the metals mixture spiked site water is statistically significant when compared to 100% survival in the site water control, EPA used the "Test for Significant Toxicity" (TST) to analyze the survival data presented for the metal mixture test in Table 3 of the Sofield review (National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document," EPA 833-R-10-033, June 2010). Table 3 of the Sofield review presents survival data for each of 4 replicates for the site water control and the metal mixture spiked site water. The results of the TST analysis was that the spiked site water was toxic. EPA recognizes that this result is in part due to the control performance (100 % survival/no variability between replicates) and is borderline with regard to being a toxicity concern. However, when combined with concerns about the water chemistry in the metals mixture test site water sample (e.g., the hardness, DOC and TSS concentrations), and the concentration of dissolved metal in the mixture test relative to the proposed site-specific dissolved criteria, the results of the TST analysis is another reason to be concerned that the proposed site-specific criteria would not be protective of aquatic life uses at the site.

DEC Response: DEC remains in disagreement with EPA regarding the validity of the results from mixed metals testing. Concerns with the results of the test were raised in December of 2010 when the test was first proposed due to the reactions that could occur when spiking the samples with multiple metals to the levels seen in site waters. The results reflect the validity of that concern. While

the test was able to meet the total levels targeted, the dissolved to total ratios are lower than what was measured with the individual spiking. DEC maintains that the results of the mixture test satisfy the requirement that "…the combination of all metals at their proposed new SSC is acceptable"[5] for three reasons:

1. The total concentrations of metal spiked in the mixture test were identical to those used in individual WER tests at the proposed criteria concentrations;
2. The metals used were highly soluble and the prepared solution contained greater than 95% dissolved metal fraction after dosing; and
3. The results showed that the primary test species endpoints for all metals were not significantly different between the control treatment and the metal mixture treatment.

As was discussed between PacRim, DEC, and EPA during development of the approved work plan both before and after the mixture testing was completed, 100 percent of the target dissolved metal fractions for copper, lead, and zinc could not be achieved in the mixed solution. This was expected based on the known solubility of these metals and the requirement to also include aluminum in the mixture, as it was one of the four metals for which WERs were generated. Aluminum is well known to impact the solubility of other metals in a mixed solution because it has flocculating properties. Other factors include the fact that the site water has relatively high concentrations of organic matter (both total and dissolved) and it has a relatively neutral pH. In summary, EPA's goal to meet the proposed site-specific criteria as a dissolved fraction for each metal in this particular solution is unachievable without altering the underlying chemistry (e.g., acidifying the site water). Thus, achieving a four-metal solution where the dissolved concentrations of copper, lead, and zinc all meet their proposed site-specific dissolved concentrations while in the presence of aluminum, is not realistic. This outcome was expected and discussed between the three parties prior to conducting the test. Additional documentation is located in (TetraTech, 2012[6])

[5] U.S. Environmental Protection Agency. *Interim Guidance on Determination and Use of Water-Effect Rations for Metals. Appendix F.* (1994) Office of Water. Office of Science and Technology. Washington, D.C.
[6] Tetra Tech Inc. *Memorandum.* August 10, 2010 *Additional Discussion of WER mixture testing*. To Dan Graham, PacRim Coal LLC

Regarding EPA's comment on the application of TST analysis; in the development of the TST analysis approach, EPA recognized that acute toxicity tests, using the recommended replication and organisms per replicate are challenging in terms of identifying an appropriate alpha value for use in the TST calculation. TST using the EPA alpha value = 0.10 for acute tests, will result in declaring a test toxic with an 11% effect (the effect observed in the mixture test) approximately 30-40% of the time given the within-test variability observed, according to EPAs TST Technical Document (EPA, 2010[7]). EPA recognized that TST may yield overprotective results given the minimum acceptable acute test design and the TST regulatory management decision for unacceptable acute toxicity of ≥ 20% effect on survival. The reason for this is that the difference between a 10% effect (which is an acceptable control response) and a 20% effect (unacceptable acute toxicity using TST) is difficult to discern with statistical confidence. For this reason, EPA recommended using more than the minimum replication in the test to increase statistical power if using TST to analyze acute test data. At this time, DEC does not use TST in their programs and therefore TST was not considered as an acceptable analysis approach for the mixture test.

Unless EPA can unequivocally demonstrate that the individual WER results are not acceptable for the development of SSC, the SSC process should rely on the results of the individual WER values rather than the mixed metals. If EPA continues to maintain its position on this issue, DEC requests examples of an EPA-approved SSC based on the results of a mixed metals test rather than on individual tests. Such a request has been made previously to EPA. DEC has made a similar request to other Region 10 states to no avail.

VI. Duration and Frequency

EPA Comment (12-12-2014): DEC should include appropriate duration and frequency components when specifying site-specific aquatic life criteria.

DEC Response: EPA's comment is noted and a footnote will be included as part of site-specific criteria for Cu and Zn, as follows:

[7] U.S. Environmental Protection Agency. *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document: An Additional Whole Effluent Toxicity Statistical Approach for Analyzing Acute and Chronic Test Data.* (2010). Office of Wastewater Management, Water Permits Division. Washington, D.C.

"The following criteria are to be met dependent upon the hardness, expressed as mg/l of calcium carbonate, of the water. Criterion maximum concentrations (CMC), one (1) hour average concentrations, and criterion continuous concentrations (CCC), four (4) day average concentrations, of the dissolved metals (in µg/l) are not to be exceed, more than once every three (3) years."

VII. Groundwater

1. High conductivity and potential impacts on aquatic life

EPA Comment (12-12-2014): Three of four strata sampled have elevated conductivity in the groundwater, exceeding the EPA aquatic life benchmark of 300 us/cm (EPA 2011). As a result, addition of groundwater to supplement surface waters at low flow (critical conditions) could have an impact on aquatic life, particularly aquatic insects (EPT) that are an important food source for juvenile salmonids.

In the DEC submission materials, it is indicated that given the groundwater-dominated nature of this system, at low flows it is expected that the surface water quality will reflect higher concentrations of metals and ions present in groundwater (Tetra Tech Inc. Memorandum, April 23, 2010, to Dan Graham, PacRim Coal, LLC.).

DEC Response: DEC objects to the inclusion of groundwater in EPA's review of the proposed SSC for waters associated with the Chuitna project. DEC believes that the role of groundwater in the discharge and the use of Whole Effluent Toxicity (WET) testing to account for the influence of groundwater can be addressed by the permitting process.

For point source discharges to surface water in Alaska an APDES permit is required. Any application will be required to identify all pollutants in the effluent including flow and concentration. Since streams in the Chuit basin are designated for spawning, mixing zones are not allowed and effluent is to meet the most stringent of technology-based limits or water-based limits at the end of pipe before discharge. Alaska does not have a conductivity based water quality standard, but we do have standards for TDS, and many of metals water quality criteria, including the SSC for Cu and Zn, are hardness based, which will account for conductivity changes from groundwater in the discharge. Engineering plan approval is also required to ensure that the most appropriate and relevant treatment technology is used to treat the effluent.

The first step in determining APDES effluent limits is to do a Reasonable Potential Analysis to determine which parameters may cause water quality criteria to be exceeded and therefore need limits in the permit. Those parameters with Reasonable Potential are assigned limits and monitoring requirements necessary to ensure that water quality criteria or technology based limits are not exceeded. These permit procedures are specified in the Technical Support Document (TSD). The department has a Calculation Tool to ensure accuracy and consistency in determining these limits. With no mixing zone, the limits apply at the end of pipe, without any dilution in the receiving environment, and are protective for all parameters with Reasonable Potential.

Monitoring requirements and limits for WET are required in all APDES permits and ensure that the effluent remains nontoxic. In this case, with no mixing zone, there is no dilution for the effluent, and the WET limit must be met before discharge. Any elevated concentrations of metals in the groundwater will be addressed during the permitting process to ensure that there is no toxicity in the effluent itself, even before it is discharged to surface water.

If the effluent fails WET testing or water quality problems in the stream are discovered relating to changes in DOC or any other parameters after permitting, corrective action will be required to determine the cause and solve the problem. Without having data from actual effluent or concurrent data from the receiving water it is not possible at this stage to guarantee success, but conservative assumptions are built into the permitting process at many stages.

Furthermore, an antidegradation analysis is also conducted as a part of the permitting process. In this analysis, DEC uses information provided by the permittee to ensure that five criteria will be met in Tier II water as specified by State statute. These criteria are:

1. The discharge and potential lower water quality is necessary to accommodate important economic or social development…;
2. Reducing water quality will not violate applicable state standards;
3. The resulting water quality will be adequate to fully protect existing uses of the water (including aquatic receptors);
4. Methods of pollution prevention, control and treatment … [are] the most effective and reasonable…;

5. Discharges will be treated and controlled to achieve the highest statutory and regulatory requirements.

DEC believes the roles and responsibilities of the Water Quality Standards section and APDES programs are well defined in statutes, regulations, and guidance. The inclusion of the role of groundwater in the review of SSC appears to set an unsubstantiated precedent. DEC requests EPA to provide formal documentation on other instances where assessing groundwater impacts was considered a requirement rather than an option during the SSC approval/disapproval process.

2. Groundwater quality and metals

EPA Comment (12-12-2014): There are also numerous acute and chronic exceedances of Al, Fe, Pb, Ag, and Zn in the groundwater (Appendix, Table 3). Also, the groundwater had low average pH (6.1-7.1, avg = 6.8; n=20), as well as low TOC (not detected to 2 mg/L, with an average of 1, n=17 with 9/17 samples identified as non-detects). Since the groundwater is proposed to be used to supplement surface flow at low flow, groundwater quality could allow for increased bioavailability of metals, particularly for copper.

DEC Response: See response at VII.1. High conductivity and potential impacts on aquatic life

B. Human Health Site-Specific Criteria for Manganese

EPA Comment (12-12-2014): EPA agrees with DEC's general approach of developing site-specific human health criteria for manganese based on EPA's 2000 human health criteria methodology. As DEC is aware, EPA has been working closely with Oregon, Washington, and Idaho for several years as they update their human health criteria, and there is significant regional tribal interest in this issue. EPA appreciates the clarifying text that DEC includes about how the inputs considered for the SSC development are specific to Chuitna and should not be interpreted more broadly. However, as reflected in some of our comments below, it is important to recognize that the State's approach in this instance may inform how the State views other similar situations involving tribal consumption. Therefore, we look forward to continuing our discussions with you on these issues. At this time, EPA is providing the following comments regarding the fish intake parameter used to calculate the criteria and the upward adjustment of the final criteria values.

DEC Response: The development of the proposed SSC for human health criteria is the result of frequent consultation with EPA. EPA provided informal comments on the proposed fish intake rate and drinking water adjustment (from two liters to six liters) for manganese. While DEC appreciates EPA's feedback, these values were selected based on the understanding that EPA considered these values to be acceptable. This site specific criterion should not be delayed to resolve all the rapidly evolving issues associated with human health criteria on a national, regional or statewide basis. This SSC is not intended to serve as a precedent for future dietary survey evaluations or criteria development.

1. Fish intake rate

EPA Comment (12-12-2014): The fish intake (FI) rate that DEC used to establish the site-specific human health criteria is based on the total fish harvest by residents of Tyonek, Alaska in 2005/2006, divided by the population of Tyonek Native Village. A more recent fish consumption study of Cook Inlet tribes (Seldovia, 2013) is cited in the draft SSC Decision Document as generally supporting the fish intake value. In selecting a fish intake rate, DEC should consider and describe in its draft SSC Decision Document:

a. [H]ow DEC determined that the area is not a subsistence harvest location for shellfish (e.g., were tribes consulted during the site-specific research?);

DEC Response: DEC reviewed Stanek *et. al.*[8] during the review of the proposed SSC. It was determined via community interviews that subsistence shellfish harvesting is limited to beaches south of the proposed project areas. Additional text and citation will be included in the draft SSC Decision Document.

b. [H]ow it considered the tribal and non-tribal populations who consume fish from the Chuitna basin and the appropriateness of deriving a consumption rate with data from all the villages who consume fish from the basin versus one village?

[8] Stanek, R.T., D.L. Holen, and C. Wassillie. 2007. Harvest and Uses of Wild Resources in Tyonek and Beluga, Alaska 2005-2006. Technical Paper No. 321. Division of Subsistence, Alaska Department of Fish and Game http://www.subsistence.adfg.state.ak.us/techpap/TP321.pdf

DEC Response: EPA 2000 Human Health Criteria guidance encourages States, Territories and authorized Tribes to use local or regional fish consumption data when developing and adopting criteria for their water quality standards, because local or regional fish and shellfish consumption patterns can differ substantially from national consumption patterns. DEC believes the 201 g/day fish consumption rate (FCR) value chosen after consultation with EPA is both conservative as well as appropriate for establishing SSC.

Data associated with members of the villages of Tyonek and Beluga should be considered as "local" under the 2000 guidance. EPA's reference to Seldovia (2013) is valid but it should be noted that Seldovia contains FCR values for the Tyonek population that are substantially less than those proposed by EPA for use in the draft SSC Decision Document. Seldovia (2013) determined the following FCR for the village of Tyonek:

Tyonek (Total Fish). Fish Consumers only. Unweighted[9]

	Average ± SE	Median	95%
All respondents	72.3 ± 13.0	62.3	160.5

Based on DEC's interpretation of EPA guidance and how similar dietary surveys in the Pacific Northwest have considered mean versus 95th percentile values, use of the proposed 201 g/day FCR value is conservative, validated and acceptable to DEC for developing SSC. Reducing this value to between 62.3 to 160.5, as determined in the Seldovia study, could be considered if EPA concurs.

c. **[T]he appropriateness of using a mean instead of the 90th or 95th percentile of a data set to derive a fish consumption rate.**

DEC Response: DEC believes that use of a mean value for the population of concern (i.e., village of Tyonek) is appropriate means of deriving a site specific criterion when applied to a highly exposed population. This method is consistent with how FCRs have been derived from tribal surveys previously used for the development of human health criteria in state

[9] Seldovia (2013) Appendix E. Adult Consumption of all listed fish and shellfish species. Average, median, and 95 percentile consumption rates (grams per day (g/d)) based on average fish meal portion size and average monthly number of meals of individual fish species as indicated by respondents.

WQS (See http://www.ecy.wa.gov/water/standards/index.html.). While application of the 90th or 95th percentile is an accepted practice for developing SSC, DEC considers its approach to be consistent with federal guidance and protective of the most highly exposed population.

2. Significant Figures and rounding

EPA Comment (12-12-2014): DEC determined that the calculated WQC for consumption of organism only and for consumption of water + organisms would be 0.283 mg/L and 0.293 mg/L, respectively. The proposed value is 0.300 mg/L for both criteria (page 27 of the draft SSC Decision Document): "DEC proposes SSC of 300 µg/L for manganese to protect human health for both consumption of water + aquatic organisms and for consumption of aquatic organisms only." The rationale for increasing the criterion for consumption of water + aquatic organisms is described on page 27 as: "DEC has determined that adoption of the 0.300 mg/L (300 µg/L) was appropriate as 0.293 mg /L (293 µg/L) is not considered statistically different from EPA's lifetime health advisory for manganese at 300 µg/L (USEPA, 2004)." EPA recommends that DEC provide a justification for adjusting the criterion for consumption of aquatic organisms only from 0.283 to 0.300 mg/L based on appropriate rounding and significant figure procedures.

Additional EPA Comment (3/15/15): The text of the SSC Decision Document on page 23 indicates that the calculated site-specific human health criterion value for consumption of aquatic organisms only is 0.283 mg/L. EPA's calculation using the same equations and input values that DEC presents on page 22 indicate that the value for consumption of aquatic organisms only is 2.83 mg/L, ten times greater.

Related to this discrepancy, EPA is correcting a comment concerning the human health site-specific criteria for manganese, with regard to significant figures and rounding (page 8 of EPA's 12-12-2014 comments).

Rather than:

EPA recommends that DEC provide a justification for adjusting the criterion for consumption of aquatic organisms only from 0.283 to 0.300 mg/L based on appropriate rounding and significant figure procedures.

EPA's comment is:

EPA recommends that DEC provide a justification for adjusting the criterion for consumption of water + aquatic organisms from 0.293 to 0.300 mg/L based on appropriate rounding and significant figure procedures.

DEC Response: The resulting criterion for the consumption of water and aquatic organisms was calculated to be 0.293 mg/L. In these calculations, there are two variables with two significant figures, body weight and relative source contribution; thus 0.293 is adjusted to 0.29. Following the rounding practices of the EPA Drinking Water Health Advisory, this value was then rounded to 0.3 mg/L (EPA, 2004).

DEC has determined that adoption of the EPA lifetime health advisory of 0.300 mg/L (300 µg/L) is the most appropriate value for SSC as it is not believed to bioaccumulate in higher organisms, there is no significant difference in adsorption of manganese from food versus water (EPA, 2004), incorporates a modifying factor of 3 for assessing exposure to manganese (identical to the modifying factor applied in the SSC formula), includes a relative source contribution value of 0.20 percent to account for uncertainty (thus making this value more conservative when the contribution of other sources is unknown), and is ultimately considered to be protective of human health.

3. Specific Comments (03-25-2015)

EPA: DEC's draft SSC Decision Document includes a number of areas where clarification would be useful. Some of these involve what appear to be inconsistencies within the document. The following comments provide examples of material that would benefit from clarification:

a. EPA has been presuming that "Tidewater terminus" means the furthest downstream point on Chuit River where there is no tidal effect, i.e., no tidal influence on river flow and no salt

water component influencing water chemistry or biology. However, it would be useful for DEC to define what it means by "Tidewater terminus" (page 1/title page and elsewhere).

DEC Response: The draft SSC Decision Document has been edited to provide clarification where the tidewater terminus is defined.

b. On page 4 there is a statement that "The proposed SSC for aluminum, copper, zinc, and manganese will fully protect the designated uses in 18 AAC 70.020(b) …" It seems the reference should be to 70.020(a) rather than 70.020(b). 70.020(a) of DEC's water quality standards lists designated uses, while 70.020(b) lists criteria to protect those uses.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

c. On page 5 there is a statement that "Only fathead minnows were tested for aluminum toxicity." However, the WER report indicates that tests with D. magna were also performed in the first two WER rounds for aluminum.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

d. On page 7 there is a statement that "PacRim refers to Bass Creek, Middle Creek, and Lone Creek as 2002, 2003, and 2004 Creeks respectively in their reports and in Figure 2." However, the pairing in that statement of Bass and Lone Creeks with their numeric names is the reverse of Figure 2 as found in the draft SSC Decision Document. Figure 2 of the draft SSC Decision Document indicates that Bass Creek, Middle Creek, and Lone Creek are 2004, 2003, and 2002 Creeks, respectively. The naming of these tributaries on page 10 of the draft SSC Decision Document is also the reverse of Figure 2.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

e. In addition to the recalculation and WER procedures that DEC references on page 12 as being the EPA methods for developing site-specific aquatic life criteria, EPA's 1994 WER guidance and WQS Handbook also include the Resident Species Procedure. The Biotic Ligand Model (BLM) can also be used to develop site-specific aquatic life criteria for copper.

DEC Response: DEC has determined that it is only requesting review of the WER and not considering other approaches at this time. DEC is not planning on acting on this comment.

f. A statement on pages 12-13 indicates that the final WER values calculated for copper and zinc were based on Daphnia magna and Pimephales promelas toxicity data. The 2010 WER report indicates that toxicity tests with fathead minnows (Pimephales promelas) were performed in the first round of WER testing for copper and zinc; however, Table 4 of the draft SSC Decision Document indicates that the final WERs were calculated using only the D. magna data.

DEC Response: DEC determined that removal of the test species column was the most appropriate response as only placing the names of the individual species used in final WER tests does not provide enough detail and confuses the reader.

g. The copper WER values presented in Table 4 (page 14) of DEC's draft SSC Decision Document of 8.49, 5.42, and 5.11 for the individual WER rounds are consistent with those in Tables 3.10, 3.11, and 3.12 and section 4.2 of the 2010 WER report (pages 22, 23, and 30). However, division of the site water LC50 by the site hardness normalized lab water LC50 (or SMAV as applicable) in the last column of those tables yields 8.8, 5.2857, and 4.875, for rounds 1 thru 3, respectively (before rounding). This comment provides additional detail to the second footnote for the table titled Comparison of BLM and WER-based Criteria for WER Round 3 on page 3 of EPA's December, 2014 comments.

DEC Comment: DEC has determined that it will not be pursuing a BLM approach and that the proposed SSC should be based on the merits of the individual WER study and values and supporting documentation.

h. The discussion of site-specific BCFs for manganese on page 25, including Figure 7, indicates that data from sites 110 and 180 were used, and associates those sites with Chuit River and Lone Creek. Table 6 (page 20), however, presents manganese data and indicates that site 110 is on Bass Creek and site 180 is on Middle Creek. The latter designations are consistent with sampling site descriptions found in PacRim's surface water baseline report (Riverside, 2009).

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

i. The last sentence on page 34 refers to data for "dissolved organic matter" in Table A1; however, Table A1 is labeled "Total Organic Carbon."

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

j. Table B2, page 49, presents water quality data for the sample used in the metals mixture toxicity test, and additional data for that sample are presented in the SSC methodology review (Sofield, 2014); however, the stream flow when the sample was collected for the metals mixture toxicity test has not been reported.

DEC Response: DEC is unsure of the relevance of this comment. Clarification is requested**.**

k. The values presented in Tables B3 and B4, page 51, for the "dissolved acute criterion" for copper and zinc, presumably intended to represent the proposed acute site-specific criteria for those metals, do not match the values presented in Table 5, page 16, for the proposed acute site-specific criteria for copper and zinc.

DEC Response: The proposed SSC shown in Table 5 differ from those presented in Table B3 and B4 because the criteria in Table 5 are based on a hardness of 25 mg/L (as $CaCo_3$) while the proposed SSC shown in Tables B3 and B4 are based on a hardness of 38 mg/L. The latter was based on the hardness recorded in the site water sample used in the metal confirmation testing. In reviewing Tables B3 and B4, however, a small mathematical error

was identified and corrected for the proposed copper criteria values, which resulted in a small change to the "percent of criteria" values presented as well (see corrected values in Tables). These changes do not affect the WERs or proposed criteria reported in Table 5. Proposed criteria values for zinc and aluminum in Table B3 and B4 are correct. Again, these differ from the proposed criteria in Table 5 due to the use of a different hardness value (25mg/L for Table 5 and 38 mg/L for Tables B3 and B4 respectively). The SSC will continue to be hardness dependent and WER adjusted.

Table B3. Summary of the proposed metals criteria, WER tested concentrations, and survival of *Daphnia magna* test species in acute exposures. (PacRim 2010)

Sample	Mean Survival	Metal	Total Recoverable acute criterion (ug/L)	Measured total recoverable (ug/L)	Measured value as % of total criterion	Dissolved acute criterion (ug/L)	Measured dissolved (ug/L)	Measured value as percent of dissolved criterion
Laboratory Control	95%	Al	750.0	5.0	0.7%	NA	10.0	NA
		Cu	37.7	4.1	10.7%	36.2	0.5	1.4%
		Zn	61.8	2.5	4.0%	60.4	2.5	4.1%
Site	100%	Al	750.0	232.5	31.0%	NA	49.0	NA
		Cu	37.7	0.8	2.1%	36.2	1.5	4.1%
		Zn	61.8	5.1	8.3%	60.4	6.8	11.3%
Spiked site	85%	Al	750.0	700.0	93.3%	NA	0.1228	NA
		Cu	37.7	35.5	94.2%	36.2	14.5	40.1%
		Zn	61.8	65.3	105.7%	197.2	30.8	50.9%

Table B4. Summary of the proposed metals criteria, WER tested concentrations, and survival of *Pimephales promelas*. test species in acute exposures. (PacRim 2010)

Sample	Mean Survival	Metal	Total Recoverable acute criterion (ug/L)	Measured total recoverable (ug/L)	Measured value as % of total criterion	Dissolved acute criterion (ug/L)	Measured dissolved (ug/L)	Measured value as percent of dissolved criterion
Control		Al	750.0	5.0	0.7%	NA[1]	5.0	NA
		Cu	.37.7	0.8	2.0%	36.2	0.5	1.4%
		Zn	618	2.5	4.0%	60.4	4.3	7.0%
Site	97.5%	Al	750.0	320.0	42.7%	NA[1]	46.0	NA
		Cu	37.7	0.5	1.3%	36.2	0.5	1.4%
		Zn	61.8	3.2	5.2%	60.4	4.5	7.4%
Spiked site	97.5%	Al	750.0	662.5	88.3%	NA[1]	118.0	NA
		Cu	37.7	37.8	100.2%	36.2	15.8	43.5%
		Zn	61.8	67.8	109.7%	60.4	34.8	57.5%

1. Acute criteria for aluminum are not being proposed. The statewide criteria of 750 µg/L will still apply.

4. Further Considerations (03-25-2015)

EPA Comment: Additional considerations regarding the proposed SSC and agricultural use change may arise during the course of EPA consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service under the Endangered Species Act and during government-to-government consultation with the Tyonek native village and others, as applicable. DEC's response to these and earlier comments may also generate additional comments. EPA supports DEC's effort to identify all considerations related to the proposed Chuitna SSC and agricultural use change and will keep DEC apprised of any new issues raised during tribal consultation and ESA consultation with the Services, as applicable.

DEC Response: DEC fully expects additional comments to be raised during consultation but also expects to be included in conversations with the services per 205J and PPG workplan grant language:

> **205J Task 4.** The project coordinator will work with EPA on requests for, site specific criteria and/or reclassification of waterbody uses for adoption in Alaska Water Quality Standards. The project coordinator will coordinate department permitting staff, EPA Region 10, and participation from other agencies, as needed, in developing potential proposals and reviewing supporting data and information. The department will work early with EPA to attempt to develop tasks in accordance with CWA requirements and participate in consultations on ESA and EFH as appropriate.
>
> **PPG DEC Tasks/Activities:** Participate in early and substantive exchange of information with the Services to facilitate timely resolution of Endangered Species Act/Essential Fish Habitat (ESA/EFH) issues.

C. Agricultural Use Change (Reclassification)

1. EPA Comment(s) provided 12-12-2014

a. The scope of the criteria is not clear in the document. EPA requests that the seasonal revision of the manganese irrigation criterion would be reflected in the actual revised water quality standards regulation.

DEC Response: DEC thanks EPA for its comment and has corrected the Use Decision Document accordingly.

b. DEC should edit Table 3 to refer to "agriculture" rather than "irrigation".

DEC Response: DEC edited Table 3 to say agriculture (including irrigation).

c. Inclusion of Reference to 40 CFR 131.10(a)

DEC Response: DEC thanks EPA for its comment and has corrected the Decision Document accordingly.

d. DEC states that agriculture "has never been demonstrated (or documented) within the watershed" and that homesteading has not occurred on or after 1975. Please cite.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

e. DEC should ensure that the evaluation considers livestock watering in addition to irrigation.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly. DEC will add language that states that livestock have not now, nor have they been watered in this watershed as of 1975-similar to that of EPA comment #4.

f. DEC should include documentation on how the June 1 to September 15th growing season was determined.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly. DEC has added growing season information available through U.S. Agriculture Department

g. DEC should include a discussion in the use and value assessment as to whether there are any downstream uses that could be affected by reclassification.

DEC Response: DEC thanks EPA for its comment and has corrected the document accordingly.

h. EPA is interested in comments from tribal users and recommends that DEC request feedback on agricultural uses from Tyonek.

DEC Response: DEC has established policies and protocols for collecting input from the public on proposed regulatory actions. DEC will be accepting public comments and holding a public hearing on this issue prior to adoption per public process requirements outlined at 18 AAC 70.230(b)

D. Downstream Protection (provided 1-8-15)

EPA Comment: (General) EPA commends DEC for conducting a loading analysis.

DEC Response: DEC believes that the loading analysis performed in support of this project is sufficient and consistent EPA's Downstream Protection Decision Tool and companion document *Protection of Downstream Waters In Water Quality Standards: Frequently Asked Questions.* [10]

1. Site-Specific Criteria Used for Copper and Zinc

EPA Comment (01-08-2015): The draft proposed WQS amendment for the SSC and the supporting draft SSC Decision Document provide final SSC values for copper and zinc that are based on a hardness of 25 mg/L as CaCO3. These draft proposed SSC values are not hardness-based and would apply to the waters without adjustment. However, the criteria used for copper and zinc for the downstream loading analysis appear to be generated by applying the proposed WER to the Alaska criteria after adjusting for hardness. This results in lower criteria than the proposed SSC because the measured or predicted hardness in the waters is generally less than 25 mg/L. As a result, the loading rates are lower than they would be if the draft proposed SSC were used.

This comment is intended for consideration in conjunction with comment IV of EPA's December 12, 2014 comments, which raised questions about the protectiveness of SSC for copper and zinc that are based on a hardness of 25 mg/L. The approach of calculating instantaneous SSC without a low hardness cap, as was done for the downstream analysis, would be more protective than basing the SSC on the hardness value of 25 mg/L. In any case, the downstream evaluation should use the SSC that are proposed in the accompanying draft SSC Decision Document.

DEC Response: DEC concurs with EPA's concern regarding use of a fixed versus a formula (i.e. hardness based) value. See DEC Response to section IV. Hardness at which criteria are calculated for copper and zinc in this document.

2. Adjustment of the Loading Rate for Percent Effluent Discharge

EPA Comment (01-08-2015): The draft SSC Decision Document states: "The preliminary loading analysis used a broad conservative assumption that 50 percent of the total flow in project area streams would be from effluent discharges with dissolved copper concentrations at 95% of the proposed chronic SSC." The loading prediction tables in Tetra Tech's 12/17/2013 technical

[10] Reviewed at http://cfpub.epa.gov/wqsits/downstream-protection-tool/ on May 29, 2015

memorandum re: *Loading Analysis* include the following statement under the table titles: "Assumes that Total Stream Flow at Discharge is 50 percent effluent." (Lower effluent flow rates are assumed during storm events for copper in Table 7.) This assumption appears to be reflected in the metals concentration entries in the predicted loadings tables, i.e., Tables 4B, 5B, 6B, and 7, which are proportionally less than the SSC. The reduced concentrations are then converted to loading rates and carried through the downstream analysis.

This approach is based on the idea that the mine effluent is near the SSC concentration and that it is diluted by the cleaner tributary water to a value lower than the SSC. However, the assessment question for the SSC is: Does allowing the tributary concentration to go up to the SSC concentration, which is what would be allowed by the SSC, push the mainstem over the statewide criterion? To answer this question, the tributary metal concentrations should be set to the SSC values, not flow-adjusted values. Put another way, we are not evaluating a NPDES permit limit equal to the SSC, but rather the effect of allowing the entire tributary to have a metal concentration at the SSC.

DEC's approach to the loading analysis would be consistent with a NPDES permit that does not allow a mixing zone. In this case, the effluent would meet the SSC at the point of discharge and the receiving water would in effect dilute the discharge to a level below the SSC. EPA recommends discussion with DEC on this topic.

DEC Response: DEC disagrees with EPA's premise that the appropriate analysis is to assume that the water quality of the entire stream segment would be equal to the SSC. DEC believes that such a condition cannot occur in this waterbody or any other Tier 2 waterbody where the water quality is better than the applicable criteria consistent with the state antidegradation policy in 18 AAC 70.015. The premise of chemical uniformity assumed by the comment would always fail a downstream loading analysis except where a very small stream with insignificant flow enters a much larger waterbody with significantly higher flows.

The stream segments under consideration are currently, and after application of SSC, Tier 2 waterbodies, where the existing water quality is better than that required to support existing uses. This is certainly the case for copper and zinc. It would be unrealistic to assume a loading

application that is inconsistent with ambient site water quality in order to perform a reasonable assessment of downstream loading effects. The assumed conditions of 50 percent of stream flow being effluent and that the effluent limit is 95% of the SSC is an extremely conservative application for two reasons:

- The effluent limits in the APDES permit will be developed assuming a water quality standard based on a 15th percentile site hardness;
- The effluent limit in the APDES permit will be developed assuming a high degree of variability (i.e. a 0.6 coefficient of variation) which would make it much less than 95% of the SSC;

Considerations of ambient site conditions are appropriate and necessary for conducting a meaningful downstream assessment, a 305(b) water quality assessment, or in calculating a TMDL. It is certainly appropriate in evaluating a potential degradation in water quality in a Tier 2 waterbody.

Once a carefully conducted WER study is performed on a specific site water, the use of that WER to set appropriate criteria on that waterbody can be made, regardless of whether there are permitted discharges or not. The WER demonstrates the toxicity that can be supported in that water and is much more specific than the default EPA criteria. It does not define what the actual water quality is or whether it is a Tier 1 or Tier 2 waterbody. One important premise of the CWA is that water quality criteria can be changed either up or down as additional data and science become available. The accurate and appropriate development of the WER should be the focus of a review, not the assumptions used in a presumptive discharge scenario.

Please also see responses to EPA comment VII regarding APDES permitting, application of reasonable potential, calculation of effluent limits, non-allowance of mixing zones in salmon bearing streams, and application of the antidegradation analysis during permitting. Rates of discharge and effluent limits and other conditions will be developed as a part of the permitting process.

3. Scope of Available Data

EPA Comment (01-08-2015): According to the TetraTech 12/17/2013 loading analysis memo, none of the sampling events represent a low-probability event. The return periods for the high and

low flow events are 1 year and 1 to 2 years, respectively. Are additional data now available that could be used to expand the temporal scope of the analysis to a return frequency that approximates the "frequency of exceedance" component of the SSC? Please see comment VI in EPA's 12/12/2014 comments.

DEC Response: Additional site-wide flow and water quality data are not available. As specified in the memorandum, Tetra Tech used all sampling events that were available where concurrent water quality and flow measurements were made at sampling stations both associated with the project drainages and the Chuit River. As presented in the memorandum, the analyzed flows were not in the range that would be considered extremely low-probability events such as those exceeding the 10-year peak flow (i.e. > 5,000 cfs). The flows analyzed are relatively low and within flow regimes that prevail across the site. Loading analyses are generally not conducted for low-probability storm events because they are generally not considered to be a critical flow regime for protectiveness of aquatic life. As previously indicated, the performed loading analysis generally followed methods outlined by EPA's Technical Support Document for Water Quality-Based Toxics Control (TSD). As discussed in Section 4.2.2 of the TSD, low flows have "traditionally" been used and accepted for calculation of the TMDLs, evaluation of mixing zones, and long-term water quality assessments.

4. Application of the Aluminum SSC

EPA Comment (01-08-2015): The description of the waters to which the aluminum SSC will apply may be incorrect in the draft proposed draft SSC Decision Document. The draft SSC Decision Document states (page 18), "...the proposed SSC will include the lower Chuit River (between the confluence of Lone Creek and the tidewater terminus) as well as the three tributaries." The confluence of Lone Creek with Chuit River is downstream of Bass Creek, so this description excludes the reach of Chuit River between the confluence of Bass Creek and Lone Creek. Page 10 of the draft SSC Decision Document includes a similar description. However, according to the draft proposed WQS amendment for the SSC, the SSC for aluminum and manganese will apply in the Chuit River lower main stem "From Confluence of Bass Creek to the tidewater terminus," not from Lone Creek. This discrepancy should be resolved.

DEC Response: EPA is correct regarding the spatial extent of the proposed SSC. DEC will correct the draft SSC Decision Document to include the appropriate portions of the main stem of the Chuit River between the confluence of Bass Creek and the confluence of Lone Creek.

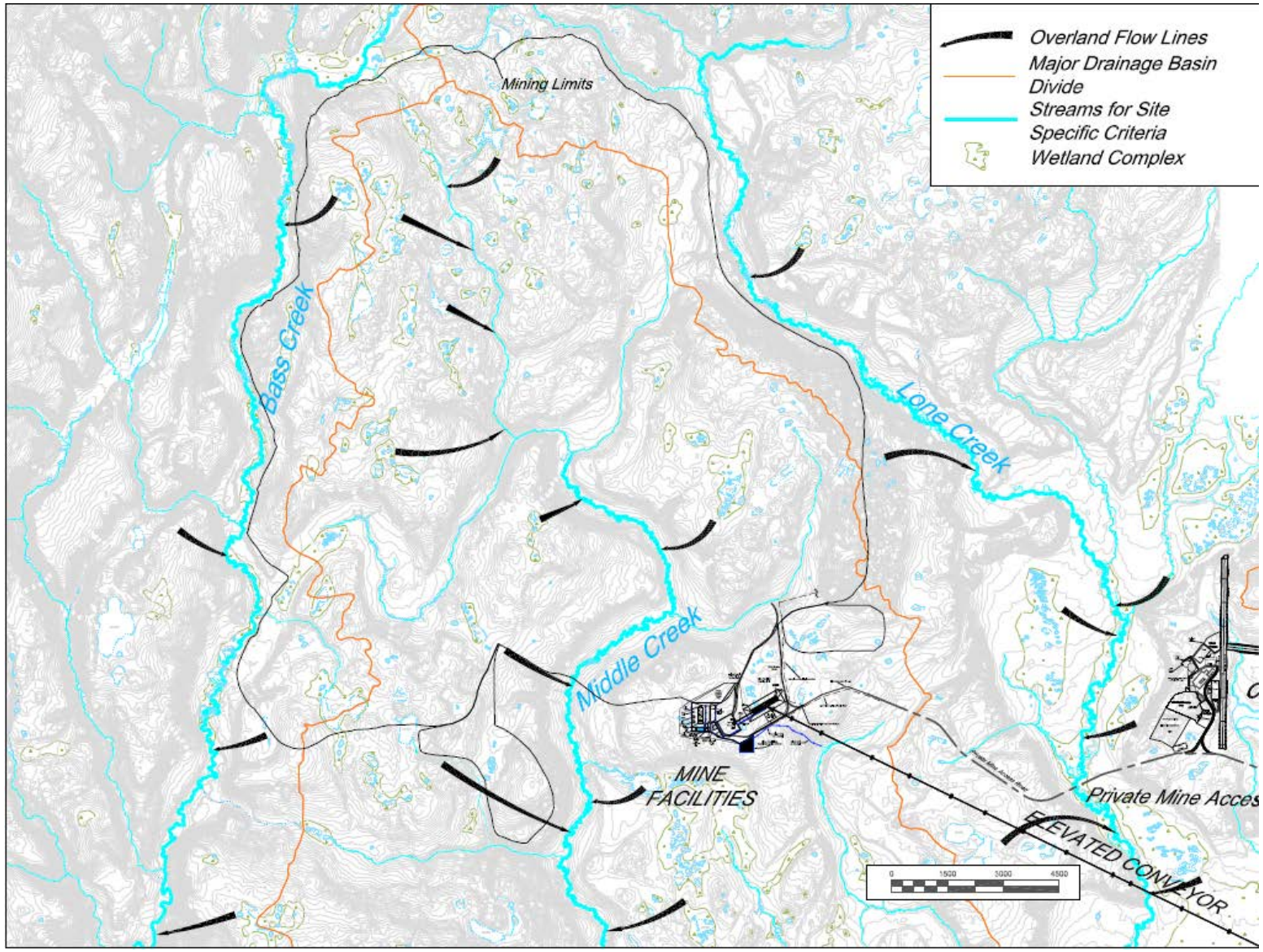
E. Tribal Resource Rights (EPA, 3-25-15)

EPA Comment: When acting on a state's WQS submission, the EPA must ensure that the WQS comply with the CWA as well as any other applicable laws. This may include laws that apply to tribal resources, such as reserved fishing rights found in treaties, court cases, and federal statutes (e.g., land claim settlement acts). Accordingly, the State's proposed rule should address any applicable tribal resource rights, including reserved fishing rights, and evaluate whether the WQS revision may impact those rights and if so, how those rights may be impacted. EPA is available to assist the State to in identifying other applicable laws and evaluating how they may impact DEC's WQS revisions.

DEC Response: DEC has consulted with the Alaska Attorney General's Office (AGO) on this issue. The AGO has advised DEC that Alaska Native Claims Settlement Act (ANSCA) at 43 USC 1603(b) explicitly extinguished all aboriginal fishing rights held by tribes in the State of Alaska. DEC has statewide environmental regulatory jurisdiction under ANCSA to set water quality standards for all Alaska waters, including waters in or adjacent to native lands. All potential revisions to water quality standards are subject to public notification processes outlined in Alaska state code.

Appendix A

Figure A-1. Figure A on the following page depicts the project area, flow direction, and location of significant hydrologic features including lakes and wetlands.


Overland Flow Lines
Major Drainage Basin Divide
Streams for Site Specific Criteria
Wetland Complex
Mining Limits
Bass Creek
Lone Creek
Middle Creek
MINE FACILITIES
Private Mine Acces
ELEVATED CONVEYOR
0
1500
3000
4500